Claims 29-44 have been rejected under 35 USC 112, second paragraph. Terminology deemed indefinite has been deleted or altered to avoid this rejection. To the extent the rejection may still be maintained, despite the present amendment and explanations, such rejection is traversed.

Regarding the examiner's comments beginning at the bottom of page 7 of the Office Action of December 20, 2005 ("Response"), at page 8, line 3 of the Office Action it is stated "applicants [sic] state that they wash away their slurry four times". This is incorrect and puzzling since at page 6, line 16 of applicant's specification it is stated: "The residue does not need to be washed". This is, in fact, a significant characteristic of applicant's invention which distinguishes it, for example, from Jaques et al. and Iwu which wash their silica products four times (Jaques et al., col. 5, line 19; Iwu, col. 1, lines 52-57). Since applicant specifically leaves a residue of sodium sulfate in his product to enhance its utility, this is not an insignificant difference.

Claims 29-44 have been rejected under 35 USC 103(a) as unpatentable over five alternative references alone or in view of four supporting references.

Initially, it is difficult to see how an invention now defined by a total of fourteen claims requires reliance on nine different references in attempting to show that the invention is not patentable.

Essentially, applicant's invention is directed to a specific treatment of bauxite tailings involving neutralization and removal of sodium hydroxide to produce a refined product useful as a component for cementitious building materials. Nothing in the cited prior art describes applicant's claimed invention nor is there any basis for combining the cited, disparate references to selectively suggest the invention.

To establish prima facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. See In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). All words in a claim must be considered in judging the patentability of that claim against the prior art. See In re Wilson, 424 F.2d 1382, 165 USPQ 494, 496 (CCPA 1970), and MPEP §2143.03.

In the Office Action it is asserted that Jaques et al. teaches mixing a silica rich ore including bauxite waste by mixing with sulfuric acid. Jaques et al., however, states at col. 4, lines 22-25 that any silica rich ore can be used (although bauxite is preferred) along with any strong acid. Considering the wide range of "silica rich" substances available (silica being a principal constituent of the Earth's crust), as well as the availability of numerous "strong acids", and the requirement that the silica ore be dissolved, col.4, line 31, (or "digested"), at 150° - 450° F. over 24-48 hours, it is more than unlikely one skilled in the art would be led to applicant's invention, which is specific to treating bauxite tailings only, with sulfuric acid to remove sodium values by neutralizing sodium hydroxide to a pH of 5.5-6 (not 7). Jaques et al. does not, in fact, even mention neutralizing sodium hydroxide values present in bauxite waste as a result of treating the bauxite in the Bayer process.

It is axiomatic that a rejection under 35 USC 103 cannot properly be made out by "cherry picking" random teachings from a broad disclosure absent a specific suggestion in the reference. In determining the differences between the prior art and the claims, the question under 35 USC 103 is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious. Stratoflex, Inc. v. Aeroquip Corp., 713 F.2d 1530, 218 USPQ 871 (Fed. Cir. 1983); Schenck v. Nortron Corp., 713 F.2d 782, 218 USPQ 698 (Fed. Cir. 1983); and MPEP §2141.02. Clearly, Jaques et al. has no interest in or cognizance of

neutralizing sodium hydroxide in bauxite tailings or in assuring that a sodium sulfate residue remains in the treated product. Applicant's claims specifically state that the slurry is not washed, but Jaques et al. washes its product four times. See Jaques et al., col. 5, line 19. A prior art reference must be considered in its entirety, i.e. as a whole, including portions that would lead away from the claimed invention. MPEP §2141.03.

Contrary to the examiner's assertion, "digesting" silica is not the same as neutralizing sodium hydroxide as illustrated by Jaques et al.'s own alternative use of "dissolving" for "digesting". Further, though Jaques et al. may prefer sulfuric acid in order to provide some unspecified sulfur component (col. 4, lines 33-34), there is no recognition or suggestion of requiring sulfuric acid in order to neutralize sodium hydroxide and produce sodium sulfate. Jaques et al. explains that other strong acids can be used for digestion as long as sulfur (in some, unspecified form) is later added.

Further, Jaques et al. col. 4, lines 61-62 begins with 100 tons (200,000 lbs.) of bauxite (not tailings) to which is added 77,000 lbs. of 93% pure sulfuric acid, or 38.5% by weight. To that is added roughly 20,000 lbs of wash water which would bring the acid concentration in the digester to around 66%. At this concentration and at the prescribed temperature and pressure, only very exotic metallurgical systems would be able to withstand the acidic attack brought on by the prescribed conditions for even a short time let alone two days as mentioned in col. 4, line 39.

The pH of a 66% concentration of acid mixed at STP will yield a mixture with a pH of less than 1, an extremely acidic slurry. If Jaques et al. separates the insoluble component before the precipitation, is it sent back to the tailings pile in its highly acidic state? If not, how is it

neutralized before its disposal? The foregoing is in direct contradiction to the assertion that Jaques et al.'s material and process are within applicant's claimed range.

Nowhere does Jaques et al. describe or suggest how the digestate, the dissolved alumina and silica (liquor), are separated from the insoluble solids. Does it happen before the precipitation process? Or does it allow the aluminate and silicate to precipitate back into the insoluble slurry? This cannot be the case because in its comparative assay table (col. 5, lines 35-45) the "Pozzament" column shows clearly that it contains less than ½ of 1% of iron oxide. It is well known in the industry that bauxite tailings of virtually every species contains up to 40% iron oxide by weight.

Applicant's process describes a method to utilize the entire cross section of the spent tailings from a Bayer process alumina refinery as a supplement to the aggregate component in concrete building materials with 0% residual waste at the end of the process. Jaques et al. does not teach this level of efficiency.

The desilication product is the "waste product" referred to by Jaques et al. and the examiner in col. 3, lines 63 and 64. This material represents a small portion of the total waste stream generated by a Bayer process alumina refinery. It is not the same as the red mud that is universally dry stacked and impounded at alumina refineries.

Regarding claims 34 and 39 and their dependent claims, the size and importance of the 16 mesh screen is manifold. First, it ensures that the tailings have been sufficiently comminuted so that any caustic present will become ionized during the hydration process and so will represent "preferred" reaction sites when the acid is added to reduce the "time 'til contact" of the active agents to one another. This helps to reduce the number of ancillary reactions that might

otherwise take place and serve to add impurities to the recovered chemicals as they are precipitated from the supernatant brine.

Second, a large percentage (roughly 30%) of bauxite tailings will usually pass a 100 mesh screen. Since all concrete mixtures have typically low threshold tolerances for "fines" of this order of size, the invention should not further exacerbate the current status quo of the tailings by further reducing the average size of the material.

Third, typically most particles that will not pass a 16 mesh screen are usually silicates, so, in order for them to pass they must remain in the ball mill until they are sufficiently reduced in size to pass the 16 mesh screen. In so doing, a statistically important percentage of those silicates will be reduced enough to a) pass the screen and b) be small enough to have a pozzolanic effect to any aggregate to which it is added.

In the alternative, Iwu '567 is cited in the Office Action as teaching the treatment of bauxite tailings with hydrochloric acid to neutralize the tailings. The examiner asserts hydrochloric and sulfuric acids are functional equivalents for applicant's invention. This is incorrect since hydrochloric acid would not result in sodium sulfate residue, which is a claimed element of applicant's invention. (It will be further noted that Jaques et al. confirms the non-equivalence of the two acids by requiring addition of sulfur if hydrochloric acid is used.)

Iwu uses hydrochloric acid, and though the sodium chloride derived from his process can be used as an accelerator in concrete, it is well known in the industry to be a very poor selection for that use because of its corrosive effect on reinforcement steel commonly used in concrete placements, as well as having very poor efflorescence resistance leading to what is called in the industry as the "white death", thereby teaching away from applicant's invention.

As previously noted, Iwu washes its solids four times and so teaches away from applicant's invention, which deliberately does not wash its solids for the expressed purpose of improving its performance characteristics. A prior art reference must be considered in its entirety, i.e. as a whole, including portions that would lead away from the claimed invention. MPEP §2141.03. Clearly, Iwu sees no reason to use sulfuric acid, does not wish to produce sodium sulfate or to retain a residue of sodium sulfate by avoiding repeated washings.

Regarding the examiner's query with respect to "catalysts", it is again noted that applicant is not required to provide mechanistic or theoretical explanations for the invention. It does appear, however, that at the beginning of the cure process, sodium sulfate buffers the progress of the formation of the hydrated calcium carbonate crystals in cement. In later stages of the cure, however, the curing process is prolonged and includes tertiary crystal formation so that the agglomeration of crystals appears to form around the aggregate to form a uniform crystal matrix having unique efflorescence resistance and compression strength.

Yet another cited, primary reference relied on is GB1474056. This patent is essentially concerned with abstracting a solution of sodium chloride or brine from red mud without contamination by chlorides of iron, titanium, silicon and aluminum. The alternative use of sulfuric acid is mentioned briefly as prior art producing a contaminated product, with no suggestion or recognition of the advantage of a sodium sulfate residue remaining in the unwashed residue. This patent, in fact, provides for washing the residue at least four times. Nor does the patent appreciate the significant distinction between sodium chloride and sodium sulfate in the practice of the invention.

GB1484671 to Gnyra et al. is cited as teaching the alternative use of sulfuric or hydrochloric acids to neutralize bauxite tailings to a pH of 6.6 to 7.3, which is well outside

applicant's claimed range of 5.5 to 6.0. Further, Gnyra et al.'s process is aimed at producing a flocculating sorbent that will cause the precipitation of entrained septage while at the same time "take up" soluble phosphates also entrained in municipal and commercial waste water streams in order to obtain clean(er) water than with other selected currently available materials. The Gnyra et al. patent does not teach the selective leaching of caustic soda, nor how to form building materials of any kind. Neither does it refer to what is to be done with the polluted flocculate residue. The finished product does not transform the waste from alumina refineries into a finished consumer product with no environmental impact. Gnyra et al. also stipulates that the invention is formed from a subset of the Bayer process waste stream; the "desilication product" as referred to on page 1, lines 23-25 of the patent. The entire cross section of the Bayer process waste stream is not used, as in applicant's invention.

The examiner makes reference to pH values on page 3, table II of Gnyra et al. with the inference being that since the pH of Gnyra et al.'s end product is in the same range as applicant's, that they teach similar art. This is incorrect. The pH levels in that table refer to the pH levels of the waste water, post treatment, with Gnyra et al.'s invention. In point of fact, the pH of Gnyra et al.'s end product is a highly acidic 2.8 to 3.8 when added to five parts water. See page 2, line 56 of

Gnyra et al.

If mixed with cement, this highly acidic compound would most likely react with the lime (a basic constituent of Portland cement) and very likely neutralize much of it, thereby impeding some or many of the secondary and tertiary reactions needed to form strong concrete. The end result would be of very low compressive strength, if any.

Finally, among the primary references relied on in the rejection is JP55092200 which describes a slow, multistage batch process in which red mud is neutralized in three steps over 24 hours. at pH ranges of 7-10, 6.5 and 5.5. Neither the described process nor the ultimate product use is anything like applicant's invention and certainly would not suggest it to one skilled in the art. In fact, so far is this patent from applicant's invention, that the rejection has required a number of highly dubious assumptions.

JP55092200 suggests using treated tailings as road construction materials. Which kind? Asphalt, gravel, cobblestone, wood planks, concrete? The examiner assumes concrete, which happens to be cementitious. What is the basis for this assumption (other than a healthy dose of hindsight)?

The examiner assumes removal of liquid from the treated tailings resulting in a residue of sodium sulfate. Accepting the questionable assumption of liquid removal, why is it not also assumed that all sodium sulfate is removed too? Or, if not, that residual sodium sulfate is removed by repeated washings—say, four washings as in Jaques et al., Iwu and GB1474056? To establish prima facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. See In re Royka, supra. All words in a claim must be considered in judging the patentability of that claim against the prior art. See In re Wilson, supra and MPEP §2143.03.

Four additional secondary references have been cited also in support of the five primary references. The examiner's position is that these secondary references all suggest the advantages of certain additives for cementitious products. But secondary references are not applicable in a vacuum. There must be some disclosure that suggests their teachings' application to the primary references' disclosure in a way relevant to the claimed invention. The teachings or suggestions

to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. See In re Vaeck, 947 F.2d 488, 20 USPQ 2d 1438 (Fed. Cir. 1991) and MPEP §§ 2142, 2143. In determining the differences between the prior art and the claims, the question under 35 USC 103 is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious. See Stratoflex, Inc. v. Aeroquip Corp., supra; Schenk v. Nortron Corp., supra and MPEP §2141.02. Applicant's invention is a process for treating bauxite tailings to obtain a product enhanced by a specific residue and uniquely suitable for use in cementitious and other products.

Rusinov teaches a formulation of an additive to a concrete mixture to be used as a method of enhancing working times and cure strength of the finished concrete. The patent defines the role of sodium sulfate as being that of a "plasticizer of dispersed reaction components that helps to ensure uniformity". Col. 3, lines 8 & 9. Rusinov does not use bauxite tailings or any acid and it appears as though the material is purchased commercially and then mixed in the formulation.

Nakagawa also teaches an admix enhancement to Portland cement that includes "calcium aluminate and inorganic sulfates", one of them being sodium sulfate. However, the patent seems to describe the calcium aluminate as the accelerator and the sodium sulfate as a moderator or buffer to the mixture as more fully defined in col. 3, lines 8-13. So it would seem as though the catalytic properties of the sodium sulfate in this instance act as a moderator rather than an accelerator per se.

Arfaei et al. teaches the use of amino acids in conjunction with alkalies, alkaline earth metal salts of organic and inorganic origin. Col. 2, lines 58-60. In the patent's preamble it stipulates that while sodium chloride may be used as an admix accelerator, it is contraindicated

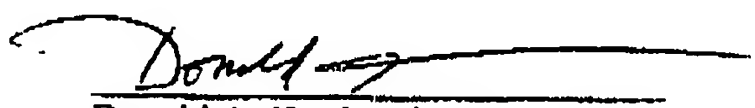
due to its corrosive effect on reinforcement steel commonly used in concrete placements. Col. 1, lines 38-42. So, while sodium chloride is technically an accelerator, it is one that is known in the industry that should not be used in the current state of the art without long term negative structural defects.

Helgesson teaches the use of sodium sulfate as an additive to conventional concrete mixtures. The patent also asserts that in a conventional concrete mixture sodium sulfate "delays the hydration during the initial, i.e. during the mixing process and accelerates the hydration during later stages when the concrete has been cast". Page 2, col. 2, lines 29-32.

What is missing from all of these supporting patents is any suggestion of a residual amount of sodium sulfate present in treated bauxite tailings which are incorporated in cementitious materials. Applicant's invention is a means towards the ultimate cleanup of alumina refinery waste sites found worldwide. By utilizing the entire cross section of that waste stream and producing cost competitive byproducts that can be used in a myriad of existing product matrixes, applicant has taken a huge intuitive leap that none of the cited references take into account: economics.

For the reasons stated above, reconsideration of this application and allowance of claims 29, 30, 33-44 is respectfully requested.

Respectfully submitted,



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